

**We claim:**

1. An optical CT scanner for small laboratory animals,  
comprising:

5           a) a housing having a vertical through opening through  
which a test subject is passed through during a scanning  
session;

          b) said housing including a peripheral slot disposed  
transversely through the perimeter of said opening;

10           c) a movable horizontal table disposed through said  
opening, said table being split with a horizontal slot aligned  
with said peripheral slot;

          d) a scanning head rotatable about said opening, said  
scanning head including a light beam directed toward said  
15 peripheral slot, said scanning head including a plurality of  
collimators directed toward said peripheral slot, said scanning  
head including a plurality of main photodetectors to detect said  
light beam after passing through the test subject and said  
collimators;

20           e) a perimeter photodetector adapted to provide  
perimeter data of the test subject during a scanning session;

          f) an electrical circuit to amplify and digitize the  
output from said photodetectors; and

          g) a first computer programmed to reconstruct an image  
25 of the test subject from the output of said circuit.

2. An optical scanner as in claim 1, wherein:
- a) said housing includes a well having a bottom; and
  - b) said opening is disposed at said bottom of said well.
- 5        3. An optical scanner as in claim 1, wherein:
- a) said table includes front and rear tables movable vertically synchronously.
4. An optical scanner as in claim 3, wherein:
- a) said front and rear tables each includes an endless
  - 10 belt; and
  - b) said endless belts are driven synchronously with each other.
5. An optical scanner as in claim 1, wherein:
- a) said scanning head comprises a vertical plate
  - 15 rotatable about an axis through said opening; and
  - b) said collimators, main photodetectors, light beam and perimeter detector are carried by said plate.
6. An optical scanner as in claim 1, wherein said scanning head comprises a plurality of optic fibers to transmit light
- 20 from a respective collimator to a respective photodetector.
7. An optical scanner as in claim 1, wherein:
- a) said photodetectors comprises first and second arrays; and
  - b) said first array is disposed above said second
  - 25 array.

8. An optical scanner as in claim 1, wherein each of said collimators include a lens operably associated with a respective optic fiber.

9. An optical scanner as in claim 1, wherein each of  
5 photodetectors includes a lens operably associated with a respective optic fiber.

10. An optical scanner as in claim 1, wherein said collimators are arranged in an arc of about 290° around said opening. 10. An optical scanner as in claim 7, wherein:

10 a) said first array is adapted for detecting attenuation light; and

b) said second array is adapted for detecting fluorescent light emitted by green fluorescent protein within the test subject.

15 11. An optical scanner as in claim 1, wherein said scanning head rotates continuously during scanning while said table moves forward, creating a helical scanning pattern around the test subject.

12. An optical scanner as in claim 1, wherein said table  
20 moves vertically during scanning.

13. An optical scanner as in claim 1, wherein:

a) said electrical circuit includes a plurality of switched amplifier circuits connected to respective photodetectors and an analog to digital converter (ADC) for  
25 digitizing the output of said switched amplifier circuits; and

b) a second computer disposed within said housing to control said switched amplifier circuits and said ADC.

14. An optical scanner as in claim 13, wherein said electrical circuit includes a slip ring to connect said second  
5 computer to said switched amplifier circuits and said ADC.

15. An optical scanner as in claim 1, wherein said perimeter photodetector is a CCD camera having a linear element.

16. An optical scanner as in claim 1, and further comprising a vertical slit to focus a landing spot of said laser  
10 beam on the test subject onto said perimeter photodetector.

17. An optical scanner as in claim 1, wherein said laser beam is generated by a laser diode.